



Europäisches Patentamt  
European Patent Office  
Office européen des brevets



(11) **EP 1 363 835 B1**

(12) **EUROPEAN PATENT SPECIFICATION**

(45) Date of publication and mention  
of the grant of the patent:  
**03.05.2006 Bulletin 2006/18**

(21) Application number: **02707104.2**

(22) Date of filing: **28.02.2002**

(51) Int Cl.:  
**B65B 3/28** <sup>(2006.01)</sup> **G01G 15/00** <sup>(2006.01)</sup>

(86) International application number:  
**PCT/IT2002/000122**

(87) International publication number:  
**WO 2002/068266 (06.09.2002 Gazette 2002/36)**

(54) **CONTAINER FILLING MACHINE**  
**BEHÄLTERFÜLLVORRICHTUNG**  
**MACHINE DE REMPLISSAGE DE RECIPIENTS**

(84) Designated Contracting States:  
**AT BE CH CY DE DK ES FI FR GB GR IE IT LI LU**  
**MC NL PT SE TR**

(30) Priority: **28.02.2001 IT BO20010108**

(43) Date of publication of application:  
**26.11.2003 Bulletin 2003/48**

(73) Proprietor: **AZIONARIA COSTRUZIONI**  
**MACCHINE**  
**AUTOMATICHE-A.C.M.A.-S.p.A.**  
**I-40131 Bologna (IT)**

(72) Inventors:  
• **CRIVELLARO, Claudio**  
**I-37138 Verona (IT)**  
• **CAVALLARI, Stefano**  
**I-40135 Bologna (IT)**

(74) Representative: **Prato, Roberto et al**  
**STUDIO TORTA S.r.l.,**  
**Via Viotti 9**  
**10121 Torino (IT)**

(56) References cited:  
**EP-A- 0 052 546** **EP-A- 0 787 978**  
**GB-A- 2 017 971** **US-A- 4 271 505**

**EP 1 363 835 B1**

Note: Within nine months from the publication of the mention of the grant of the European patent, any person may give notice to the European Patent Office of opposition to the European patent granted. Notice of opposition shall be filed in a written reasoned statement. It shall not be deemed to have been filed until the opposition fee has been paid. (Art. 99(1) European Patent Convention).

## Description

### TECHNICAL FIELD

**[0001]** The present invention relates to a machine for filling containers with liquid or particulate material.

### BACKGROUND ART

**[0002]** For this purpose, filling machines are used comprising a carousel conveyor rotating continuously about an axis; a number of feed devices for supplying the fill material, and which are carried, by the conveyor, arranged about the rotation axis of the conveyor, and located at respective loading stations; and a supporting and weighing unit carried by the conveyor to support a number of empty containers, each located at a respective loading station to receive the fill material from a respective feed device.

**[0003]** Filling of the containers is controlled by a control device off the conveyor and of "Master-Multislave" circuit architecture, i.e. comprising a main control unit ("master") and a number of satellite control units ("slaves"), wherein the slave control units are connected to the supporting and weighing unit by sliding contacts, provide solely for acquiring electric weight signals generated by the supporting and weighing unit and indicating the weight of the containers being filled, and are controlled by the master unit, which is typically defined by a personal computer and provides for acquiring and processing the weight signals, and controlling the feed devices to cut off supply of the product to the containers when the weight of the containers reaches a preset threshold value corresponding to the amount of product with which the containers are to be filled.

**[0004]** Though widely used, "Master-Multislave" control architecture, in this type of application, has various drawbacks whereby not all its advantages are adequately exploited. More specifically, being responsible for overall processing of the feed device weight and control signals, the master unit, on the one hand, constitutes a fill control "bottleneck", and, on the other, limits the extent to which the output of the machine can be increased, by inevitably limiting the maximum number of feed devices installable, maximum fill speed of the containers, and maximum rotation speed of the conveyor.

**[0005]** G82017971 discloses a filling machine comprising a carousel conveyor rotating continuously about an axis, and a number of feed devices for supplying the fill material, and which are carried by the conveyor, arranged about the rotation axis of the conveyor, and provided with relevant electrical weighing cells. The weight of each container located in a relevant feed device is monitored by the relevant electrical weighing cell before and whilst it is being loaded with a liquid product. A pre-selector unit stores the weight of product required to be loaded, and a computing device is arranged to store the weight of each container, initiate loading of the product

into the container and determine the instantaneous weight of product in the container and stop the loading when it determines that substantially the preset weight has been loaded. In particular, a relevant computing device is provided for each feed device; i.e. each electrical weighing cell works always with its own computing device, which comprises an analogue-digital converter circuit, a store, a subtracting unit, and a comparator unit. All the computing devices are arranged in a control unit, which is located in a fixed position over the carousel conveyor.

**[0006]** That is, besides providing additional loading stations and respective feed devices and/or increasing conveyor rotation and container fill speed, any increase in machine output would also mean substituting and programming a master unit of much higher processing capacity.

### DISCLOSURE OF THE INVENTION

**[0007]** It is an object of the present invention to provide a container filling machine designed to eliminate the aforementioned drawbacks of the known state of the art.

**[0008]** According to the present invention, there is provided a machine as recited by claim 1.

### BRIEF DESCRIPTION OF THE DRAWINGS

**[0009]** A non-limiting embodiment of the present invention will be described by way of example with reference to the accompanying drawings, in which:

Figure 1 shows a partly sectioned side view of a preferred embodiment of the machine according to the present invention;

Figure 2 shows a block diagram of a control device forming part of the Figure 1 machine.

### BEST MODE FOR CARRYING OUT THE INVENTION

**[0010]** With reference to the accompanying drawings, number 1 indicates as a whole a machine for filling containers, which, in the example shown, are defined by substantially cylindrical bottles 2, each positioned with its axis 3 substantially upright, and comprising, at the top, a neck 4 having, at the top end, an inlet/outlet opening 5 for a material 6, which may be particulate or, as in the example shown, liquid.

**[0011]** Machine 1 comprises a fixed base 7, a central portion of which is defined by a cylindrical column 8 having a substantially vertical axis 9 and supporting for rotation, with the interposition of bearings 10, a tubular base stem 11 of a carousel conveyor 12 fitted to base 7 and rotated continuously about axis 9 by a known drive motor not shown.

**[0012]** Conveyor 12 comprises a cylindrical base body 13 coaxial with axis 9 and defined at the bottom by a bottom wall 14 connected integrally to a top end of stem

11; and a cylindrical tank 15 also coaxial with axis 9 and supported on top of and by cylindrical body 13. Tank 15 is larger in diameter than cylindrical body 13, and is defined at the bottom by a bottom wall 16 substantially perpendicular to axis 9 and comprising a peripheral portion 17 which projects outwards of an outer cylindrical wall 18 of cylindrical body 13.

**[0013]** Conveyor 12 also comprises a number of loading stations 19 equally spaced about axis 9 and defined by respective known feed devices 20 for supplying material 6, and which extend downwards from peripheral portion 17 of wall 16 of tank 15 along respective axes 21 parallel to axis 9, and are controlled in known manner by respective valve devices 22 and by respective known flow sensors 23 shown schematically; and a supporting unit 24 for receiving bottles 2 and supporting each at a respective loading station 19, outwards of wall 18, beneath peripheral portion 17 of wall 16, and with respective axis 3 coaxial with axis 21 of a relative feed device 20.

**[0014]** Supporting unit 24 comprises, for each loading station 19, a respective supporting and weighing head 25 connected removably to cylindrical body 13 with the interposition of a fast-fit structural and functional connecting/disconnecting device or bracket 26 integral with cylindrical body 13.

**[0015]** Each supporting and weighing head 25 comprises a scale 27 having a plate 28, which has an axis 29 substantially parallel to axis 9, and which is connected integrally to a gripping assembly 30 for holding a relative bottle 2 erect on plate 28, with its axis 3 coaxial with axis 29, and comprising an upright 31 extending upwards from and alongside plate 28, and supporting a top and bottom fork 32, 33 for engaging the neck 4 and body of bottle 2 respectively.

**[0016]** With reference also to Figure 2, machine 1 also comprises a control device 34 for controlling the filling of bottles 2, and of "Multi-Master", i.e. distributed, circuit architecture, wherein a supervisor 35, for monitoring overall operation of machine 1 and the filling of bottles 2, is connected to and communicates with a number of control units 36, each for independently controlling a predetermined number of, e.g. eight or twelve, feed devices 20.

**[0017]** More specifically, control units 36 are carried by, and housed in a compartment 37 on, conveyor 12, while supervisor 35 is stationary, is located outside conveyor 12, and communicates with control units 36 by means of a dedicated bus 38 and sliding contacts 39.

**[0018]** Each control unit 36 is substantially defined by a printed-circuit-type weighing and control board 40 having a number of inputs 41 - one for each feed device 20 controlled by weighing and control board 40 - and a number of outputs 42 - one for each feed device 20 controlled by weighing and control board 40. More specifically, each input 41 of weighing and control board 40 is connected to a respective scale 27, from which it receives an electric weight signal indicating the weight of bottle 2 on scale 27; and each output 42 of weighing and control

board 40 is connected to valve device 22 of a respective feed device 20, and supplies feed device 20 with an electric control signal for regulating the amount of product supplied by feed device 20.

**[0019]** Each weighing and control board 40 substantially comprises a microprocessor 43, which is connected by bus 38 to microprocessors 43 of the other weighing and control boards 40 and to supervisor 35, and has a memory 44 (shown separately for illustration reasons) storing "firmware" for controlling the filling of bottles 2, which is performed as described in detail later on.

**[0020]** More specifically, control units 36 may conveniently be connected to supervisor 35 as per IEC standard 61131, i.e. using a CANopen-protocol CANbus line, and balanced RS-422 input/output ports indicated schematically by 45 in Figure 2; and sliding contacts 39 may conveniently be mercury-bath bearing types.

**[0021]** Supervisor 35 substantially comprises a personal computer 46 having a display unit 47, a keyboard 48, a mouse 49, and a processing unit 50, an input/output port (not shown) of which is connected by bus 38 to all the microprocessors 43 of weighing and control boards 40.

**[0022]** In actual use, before commencing a new fill process of bottles 2, the machine 1 operator, using keyboard 48 and/or mouse 49, loads supervisor 35 with fill process setting data, such as bottle type, product quantity per bottle, product type (liquid, particulate), bottle fill speed, etc.

**[0023]** Once loaded, supervisor 35 supplies the fill process setting data to microprocessors 43 of weighing and control boards 40, which store the data in memories 44, and then starts the fill process, wherein conveyor 12 is rotated continuously about axis 9, and, at each turn, each loading station 19 receives a relative bottle 2 which is unloaded when filled.

**[0024]** With reference to one loading station 19, once an empty bottle 2 is loaded on to plate 28 of relative head 25 and engaged by relative gripping assembly 30, scale 27 supplies an electric signal indicating the weight of bottle 2, which is acquired by microprocessor 43 of the weighing and control board, 40 controlling filling at that particular loading station 19.

**[0025]** On the basis of the weight signal generated by scale 27, microprocessor 43 determines, in known manner not described in detail, the weight (tare) of the empty bottle 2. Once this is done, microprocessor 43, on the basis of the setting data received from supervisor 35 at the start of the fill process of bottles 2, opens valve device 22 of relative feed device 20 to gradually fill bottle 2, the gradual increase in weight of which is detected continuously by relative scale 27.

**[0026]** Microprocessor 43 constantly monitors flow of material 6 and the weight of bottle 2 being filled, and shuts valve device 22 when the detected weight, minus the tare measured previously, corresponds with the product quantity per bottle data supplied, as stated, to microprocessor 43 by supervisor 35 at the start of the fill proc-

ess of bottles 2.

[0027] Obviously, bottle 2 is filled before reaching a station (not shown) where it is unloaded in known manner off relative plate 28.

[0028] In the event the flow of material 6 through relative feed device 20 and detected by relative flow sensor 23 is not accompanied by a continuous increase in weight of bottle 2, microprocessor 43 determines a broken-bottle condition and immediately closes valve device 22 and supplies supervisor 35 with a broken-bottle alarm signal.

[0029] In the course of the fill process, each microprocessor 43 supplies supervisor 35 with data relative to the filling operations at the loading stations 19 under its control, and supervisor 35, by means of an appropriate graphic interface, displays the data on display unit 47 to provide the machine 1 operator with real-time updated information concerning the filling of bottles 2 at each loading station 19.

[0030] In the course of the fill process, each microprocessor 43 also communicates with microprocessors 43 of the other weighing and control boards 40, with which it exchanges data relative to any dynamic variations in fill process parameters, such as the presence and magnitude of any thermal changes, any changes in the parameters (density) of the liquid fed into bottles 2, etc., so that each microprocessor 43 can take these into account in controlling the filling of relative bottles 2.

[0031] In the course of the fill process, both microprocessors 43 and supervisor 35 - the former on the basis of the weight signals, and the latter on the basis of data received from microprocessors 43 - perform diagnostic operations to determine any irregularity in the fill process of bottles 2 and so immediately correct operation of feed devices 20 and machine 1.

[0032] In connection with machine 1 as described above, it should be pointed out that dividing and distributing control of the filling of bottles 2 using "Multi-Master" circuit architecture provides for increasing as required, not only the number of loading stations 19, but also the rotation speed of conveyor 12 and the fill speed of bottles 2, thus greatly increasing the output of machine 1.

[0033] Moreover, distributing control of the filling of bottles 2 provides for obtaining a modular control device 34, wherein, weighing and control boards 40 all being identical, the number of loading stations 19 can be increased by simply providing additional weighing and control boards 40.

[0034] Moreover, by only controlling filling at a small number of loading stations 19, each weighing and control board 40 is relatively straightforward in terms of circuitry and relatively cheap.

[0035] Moreover, the wiring connecting weighing and control boards 40 to supervisor 35 is relatively straightforward and compact, thus greatly simplifying repair work as compared with currently used filling machines in which the slave units are all housed in a so-called "electric cabinet" in respective terminal boards connected to the master unit normally located close to the electric cabinet, so

that the wiring in the electric cabinet is normally packed in a confined space and awkward to work on.

## 5 Claims

1. A machine for filling containers with liquid or particulate material, the machine (1) comprising a carousel conveyor (12) rotating continuously, about an axis (9), a number of feed devices (20) for supplying the material (6), which are carried by the carousel conveyor (12), are arranged about the axis (9), and are located at respective loading stations (19), supporting and weighing means (24) carried by the carousel conveyor (12) to support and weigh a number of said containers (2), each located at a respective loading station (19) to receive the material (6) from a respective feed device (20), and electronic control means (34) to control the filling of the containers (2) and comprising a plurality of control units (36), each of which is connected to a number of relevant supporting and weighing means (24) and is able to independently control a number of relevant feed devices (20); the machine being, **characterized in that** the control units (36) are carried by the carousel conveyor (12) and **in that** the electronic control means (34) comprise a supervisor (35) for supervising the filling of the containers (2), which is stationary, is located outside the carousel conveyor (12) and communicates with the control units (36) by means of communicating means (38, 39).
2. A machine as claimed in Claim 1, wherein the supporting and weighing means (24) comprise a number of scales (27), each for supporting and weighing a respective container (2) at a respective loading station (19), and for generating an electric weight signal indicating the weight of the relative container (2); each of the control units (36) having a number of inputs (41), each connected to a respective scale (27) to receive the relative weight signal, and a number of outputs (42), each connected to a respective feed device (20) to supply an electric control signal for regulating the amount of product supplied by the feed device (20).
3. A machine as claimed in Claim 1 or 2, wherein each control unit (36) comprises a printed-circuit-type weighty and control board (40) including a microprocessor (43) connected to the supervisor (35) to exchange setting data and data relative to the fill process of the relative containers (2); the microprocessor (43) also receiving the weight signals generated by the relative scales (27), and generating control signals for controlling the relative feed devices (20).
4. A machine as claimed in Claim. 3, wherein each mi-

croprocessor (43) is connected to the microprocessors (43) of the other weighing and control boards (40) to exchange data relative to the fill Process of the relative containers (2).

5. A machine as claimed in any one of Claims 1 to 4, wherein the communicating means (38, 39) comprises a bus connection (38) for connecting the control units (36) to the supervisor (35).
6. A machine as claimed in Claim 5, wherein the control units (36) are also connected to one another by the bus connection (38).
7. A machine as claimed in Claim 5 or 6, wherein the bus connection (38) is a CANbus operating with a CANopen protocol.
8. A machine as claimed in any one of Claims 1 to 7, wherein the communicating means (38, 39) comprises sliding contacts (39) for connecting the control units (36) to the supervisor (35).
9. A machine as claimed in Claim 8, wherein said sliding contacts (39) are mercury-bath bearing types.
10. A machine as claimed in any one of Claims 1 to 9, wherein the supervisor (35) comprises a personal computer (46) having a display unit (47), a keyboard (48), a processing unit (50), an input/output port of which is connected by bus (38) to all the control units (36).
11. A machine as claimed in any one of Claims 1 to 10, wherein before commencing a new fill process of containers (2) the supervisor (35) is loaded with fill process setting data; once loaded, supervisor (35) supplies the fill process setting data to the control units (36) which store the data in memories (44), and then starts the fill process, wherein conveyor (12) is rotated continuously about axis (9), and, at each turn, each loading station (19) receives a relative unloaded container (2).
12. A machine as claimed in any one of Claims 1 to 11, wherein in the course of the fill process, each control unit (36) supplies the supervisor (35) with data relative to the filling operations at the loading stations (19) under its control.
13. A machine as claimed in Claim 12, wherein the supervisor (35) displays the data on a display unit (47) to provide real-time updated information concerning the filling of containers (2) at each loading station (19).
14. A machine as claimed in any one of Claims 1 to 13, wherein in the course of the fill process each control

unit (36) communicates with other control units (36), with which it exchanges data relative to any dynamic variations in fill process parameters, so that each control unit (36) can take these into account in controlling the filling of relative containers (2).

## Patentansprüche

1. Ein Maschine zum Füllen von Behältern mit Flüssigkeit oder partikulärem Material, wobei die Maschine (1) Folgendes aufweist:
 

einen Karussellförderer (12), der sich kontinuierlich um eine Achse (9) dreht, wobei eine Anzahl von Zuführvorrichtungen (20) zum Zuführen des Materials (6), die von dem Karussellförderer getragen werden, um die Achse (9), herum angeordnet sind und sich an jeweiligen Beladestationen (19) befinden, Aufnahme- und Wiegeeinrichtungen (24), die von dem Karussellförderer (12) getragen werden, um eine Anzahl der Behälter (2) aufzunehmen und zu wiegen, die sich jeweils an einer zugehörigen Ladestation (19) befinden, um das Material aus einer zugehörigen Zuführvorrichtung (20) zu empfangen, und eine elektrische Steuereinrichtung (34) zum Steuern des Füllens der Behälter (2), welche eine Mehrzahl von Steuereinheiten (36) aufweist, von denen jede mit einer Anzahl von entsprechenden Aufnahme- und Wiegeeinrichtungen (24) verbunden ist und dazu fähig ist, eine Anzahl von entsprechenden Zuführvorrichtungen (20) zu steuern; wobei die Maschine **dadurch gekennzeichnet ist, dass** die Steuereinheiten (36) von dem Karussellförderer (12) getragen werden und **dadurch**, dass die elektronische Steuereinrichtung (34) eine Überwachung (35) zum Überwachen des Füllens der Behälter (2) aufweist, die stationär ist, außerhalb des Karussellförderers (12) angeordnet ist und mit den Steuereinheiten (36) über Kommunikationseinrichtungen (38, 39) kommuniziert.
2. Eine Maschine nach Anspruch 1, wobei die Aufnahme- und Wiegeeinrichtungen (24) eine Anzahl von Skalen (27) umfassen, die jeweils zum Aufnehmen und Wiegen eines jeweiligen Behälters (2) an einer jeweiligen Ladestation (19) und zum Erzeugen eines elektrischen Gewichtssignals dienen, das das Gewicht des jeweiligen Behälters (2) anzeigt; wobei jede der Steuereinheiten (36) eine Anzahl von Eingängen (41) aufweist, die jeweils mit einer entsprechenden Skala (27) verbunden sind, und eine Anzahl von Ausgängen (42), die jeweils mit einer entsprechenden Zuführvorrichtung (20) verbunden sind, um ein elektrisches Steuersignal bereitzustellen, um die

Menge des Produkts zu regulieren, das von der Zuführvorrichtung (20) bereitgestellt wird.

3. Eine Maschine nach Anspruch 1 oder 2, wobei jede Steuereinheit (36) eine Wiege- und Steuerplatine (40) vom Typ mit gedruckten Schaltkreisen aufweist, die einen Mikroprozessor (43) umfasst, der mit der Überwachung (35) verbunden ist, um Einstellwerte und Daten bezüglich des Füllvorgangs der jeweiligen Behälter (2) auszutauschen; wobei der Mikroprozessor (43) außerdem die von den entsprechenden Skalen (27) erzeugten Gewichtssignale empfängt und Steuersignale erzeugt, um die entsprechenden Zuführvorrichtungen (20) zu steuern. 5
4. Eine Maschine nach Anspruch 3, wobei jeder Mikroprozessor (43) mit den Mikroprozessoren (43) der anderen Wiege- und Steuerplatinen (40) verbunden ist, um Daten bezüglich des Füllvorgangs der entsprechenden Behälter (2) auszutauschen. 10
5. Eine Maschine nach einem der Ansprüche 1 bis 4, wobei die Kommunikationseinrichtungen (38, 39) eine Busverbindung (38) umfassen, um die Steuereinheiten (36) mit der Überwachung (35) zu verbinden. 15
6. Eine Maschine nach Anspruch 5, wobei die Steuereinheiten (36) außerdem über die Busverbindung (38) miteinander verbunden sind. 20
7. Eine Maschine nach einem der Ansprüche 5 oder 6, wobei die Busverbindung (38) ein CAN-Bus ist, der mit einem CANopen-Protokoll arbeitet. 25
8. Eine Maschine nach einem der Ansprüche 1 bis 7, wobei die Kommunikationseinrichtungen (38, 39) Schleifkontakte (39) umfassen, um die Steuereinheiten (36) mit der Überwachung (35) zu verbinden. 30
9. Eine Maschine nach Anspruch 8, wobei die Schleifkontakte (39) vom Typ eines Quecksilberbadlagers sind. 35
10. Eine Maschine nach einem der Ansprüche 1 bis 9, wobei die Überwachung (35) einen Personal Computer (46) umfasst, der eine Anzeigeeinheit (47), eine Tastatur (48), eine Verarbeitungseinheit (50) und einen Eingangs/Ausgangsanschluss aufweist, der per Bus (38) mit allen Steuereinheiten (36) verbunden ist. 40
11. Eine Maschine nach einem der Ansprüche 1 bis 10, wobei die Überwachung (35) vor dem Beginn eines neuen Füllvorgangs für Behälter (2) mit Daten bezüglich der Festlegung des Füllvorgangs geladen wird; die Überwachung (35) nach dem Laden die Daten bezüglich der Festlegung des Füllvorgangs an die Steuereinheiten (36) bereitstellt, welche die Da- 45

ten in Speichern (44) ablegen, und dann den Füllvorgang startet, wobei der Förderer (12) kontinuierlich um die Achse (9) gedreht wird und jede Ladestation (19) bei jeder Umdrehung einen entsprechenden ungefüllten Behälter (2) empfängt.

12. Eine Maschine nach einem der Ansprüche 1 bis 11, wobei im Verlauf des Füllvorgangs jede Steuereinheit (36) die Überwachung (35) mit Daten bezüglich der Füllvorgänge an den Ladestationen (19) unter ihrer Steuerung versorgt. 50
13. Eine Maschine nach Anspruch 12, wobei die Überwachung (35) die Daten auf einer Anzeigeeinheit (47) anzeigt, um in Echtzeit aktualisierte Information betreffend das Befüllen der Behälter (2) an jeder Ladestation (19) bereitzustellen.
14. Eine Maschine nach einem der Ansprüche 1 bis 13, wobei im Verlauf des Füllvorgangs jede Steuereinheit (36) mit anderen Steuereinheiten (36) kommuniziert, mit denen sie Daten bezüglich jeglicher dynamischer Veränderungen von Füllvorgangsparametern austauscht, so dass jede Steuereinheit (36) diese bei der Steuerung des Befüllens der jeweiligen Behälter (2) berücksichtigen kann.

#### Revendications

1. Machine de remplissage de récipients avec du liquide ou une matière à particules, la machine (1) comprenant un convoyeur carrousel (12) tournant en continu autour d'un axe (9), un certain nombre de dispositifs d'alimentation (20) destinés à acheminer la matière (6), lesquels sont portés par le convoyeur carrousel (12), sont agencés autour de l'axe (9) et se trouvent au niveau de postes de chargement respectifs (19), des moyens de support et de pesée (24) portés par le convoyeur carrousel (12) pour supporter et peser un certain nombre desdits récipients (2), chacun se situant au niveau d'un poste de chargement respectif (19) pour recevoir la matière (6) provenant d'un dispositif d'alimentation respectif (20), et des moyens de commande électronique (34) pour commander le remplissage des récipients (2) et comprenant une pluralité d'unités de commande (36), chacune étant reliée à un certain nombre de moyens de support et de pesée associés (24) et étant capable de commander indépendamment un certain nombre de dispositifs d'alimentation (20) ; la machine étant **caractérisée en ce que** les unités de commande (36) sont portées par le convoyeur carrousel (12) et **en ce que** les moyens de commande électronique (34) comprennent un dispositif de surveillance (35) destiné à surveiller le remplissage des récipients (2), lequel est statique, se situe à l'extérieur du convoyeur carrousel (12) et communique 50

- avec les unités de commande (36) à l'aide de moyens de communication (38, 39).
2. Machine selon la revendication 1, dans laquelle les moyens de support et de pesée (24) comprennent un certain nombre de graduations (27), chacune étant destinée à supporter et à peser un récipient (2) respectif au niveau d'un poste de chargement respectif (19), et destinée à générer un signal de poids électrique indiquant le poids du récipient (2) relatif ; chacune des unités de commande (36) possédant un certain nombre d'entrées (41), chacune reliée à une graduation respective (27) pour recevoir le signal de poids relatif, et un certain nombre de sorties (42), chacune reliée à un dispositif d'alimentation respectif (20) pour acheminer un signal de commande électrique destiné à réguler la quantité de produit acheminé par le dispositif d'alimentation (20).
  3. Machine selon la revendication 1 ou 2, dans laquelle chaque unité de commande (36) comprend une carte de pesée et de commande de type circuit imprimé (40) comprenant un microprocesseur (43) relié au dispositif de surveillance (35) pour échanger des données de paramétrage et des données relatives au processus de remplissage des récipients (2) relatifs ; le microprocesseur (43) recevant également les signaux de poids générés par les graduations relatives (27), et générant des signaux de commande pour commander les dispositifs d'alimentation relatifs (20).
  4. Machine selon la revendication 3, dans laquelle chaque microprocesseur (43) est relié aux microprocesseurs (43) des autres cartes de pesée et de commande (40) afin d'échanger des données relatives au processus de remplissage des récipients (2) relatifs.
  5. Machine selon l'une quelconque des revendications 1 à 4, dans laquelle les moyens de communication (38, 39) comprennent une connexion de bus (38) destinée à relier les unités de commande (36) au dispositif de surveillance (35).
  6. Machine selon la revendication 5, dans laquelle les unités de commande (36) sont également reliées les unes aux autres par la connexion de bus (38).
  7. Machine selon la revendication 5 ou 6, dans laquelle la connexion de bus (38) est un bus CAN fonctionnant avec un protocole CANopen.
  8. Machine selon l'une quelconque des revendications 1 à 7, dans laquelle les moyens de communication (38, 39) comprennent des contacts coulissants (39) destinés à relier les unités de commande (36) au dispositif de surveillance (35).
  9. Machine selon la revendication 8, dans laquelle lesdits contacts coulissants (39) sont des types de palier à bain de mercure.
  10. Machine selon l'une quelconque des revendications 1 à 9, dans laquelle le dispositif de surveillance (35) comprend un ordinateur personnel (46) doté d'une unité d'affichage (47), un clavier (48), une unité de traitement (50), dont un port d'entrée/sortie est relié par le bus (38) à toutes les unités de commande (36).
  11. Machine selon l'une quelconque des revendications 1 à 10, dans laquelle, avant de commencer un nouveau processus de remplissage de récipients (2), le dispositif de surveillance (35) est chargé en données de paramétrage de processus de remplissage ; une fois chargé, le dispositif de surveillance (35) envoie les données de paramétrage de processus de remplissage aux unités de commande (36) qui stockent les données dans des mémoires (44), puis démarre le processus de remplissage, le convoyeur (12) tournant en continu autour de l'axe (9), et, à chaque tour, chaque poste de chargement (19) recevant un récipient (2) non chargé relatif.
  12. Machine selon l'une quelconque des revendications 1 à 11, dans laquelle, au cours du processus de remplissage, chaque unité de commande (36) envoie au dispositif de surveillance (35) des données relatives aux opérations de remplissage au niveau des postes de chargement (19) sous sa commande.
  13. Machine selon la revendication 12, dans laquelle le dispositif de surveillance (35) affiche les données sur une unité d'affichage (47) afin de fournir des informations mises à jour en temps réel concernant le remplissage de récipients (2) à chaque poste de chargement (19).
  14. Machine selon l'une quelconque des revendications 1 à 13, dans laquelle, au cours du processus de remplissage, chaque unité de commande (36) communique avec d'autres unités de commande (36), avec lesquelles elle échange des données relatives à toute variation dynamique des paramètres de processus de remplissage, de sorte que chaque unité de commande (36) puisse prendre ceux-ci en compte pour commander le remplissage des récipients (2) relatifs.

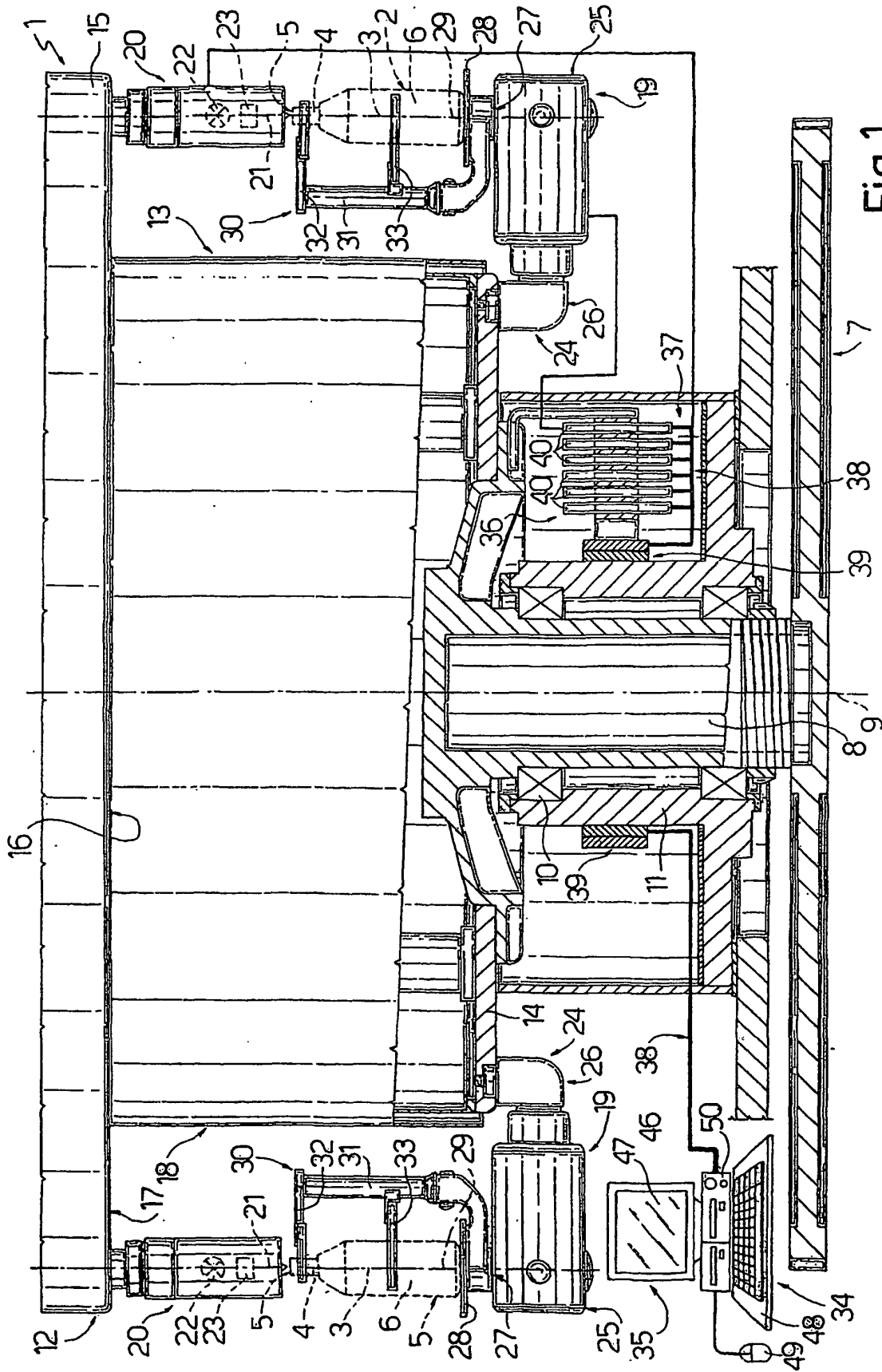


Fig.1



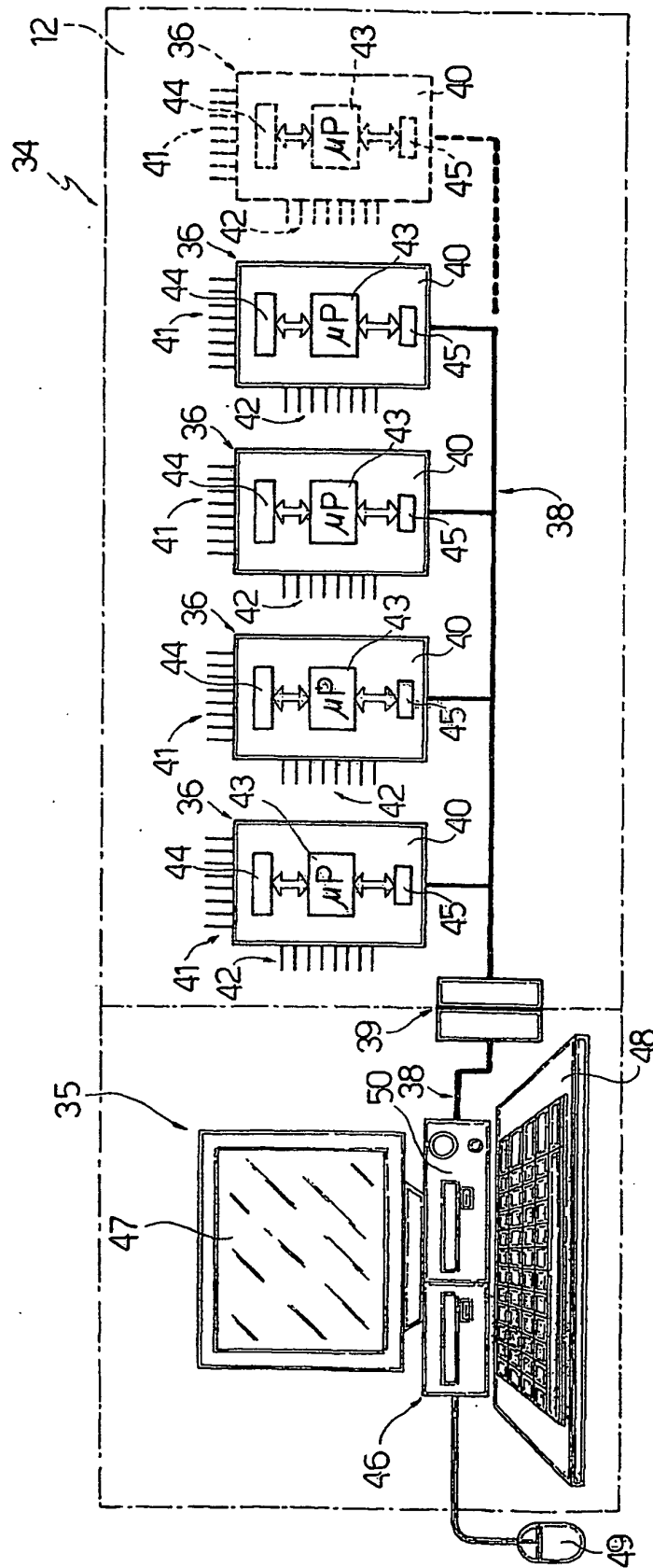


Fig.2